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THE CURTISS
STANDARD JN4-D MILITARY TRACTOR
HAND BOOK

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THE CURTISS STANDARD JN4-B MILITARY TRACTOR

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HAND BOOK

1917

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CURTISS AEROPLANE AND MOTOR CORPORATION
BUFFALO, U. S. A.

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INSTRUCTIONS FOR ASSEMBLING CURTISS STANDARD JN4-B AEROPLANE

1. PACKED FOR SHIPPING

The component parts of the standard JN4-B are packed for shipment in two cases. The case is designated by the name of its major contents, as:

(1) Fuselage.
(2) Panels.

The contents of these boxes are noted on the packing sheets. Sample packing sheets are illustrated in Figs. No. 14 and No. 15.

(1) The fuselage contains the motor set in place; the instrument board and instruments all connected up; the carburetor control and adjustment; throttle control; spark advance control, and magneto cut-out switch; all connected up and ready for operation; and the tail skid in place. The control bridge is in place. The leads attached to drum and wheel of bridge, for operating the ailerons, will be found wrapped around the seat rails; the leads for controlling the elevators will be found attached to the sides of the U bridge, with ends passed through the fairleads and coiled up in the fuselage back of the pilot's seat. The rudder control wires are attached to the foot control bar, and leading to the rear end of the fuselage cover, are coiled up ready for leading through the fuselage for attachment to the rudder.

The landing gear, completely assembled without the wheels, and with the cross-stay wires connected up but slack, is also packed in this case. The wheels of the landing gear, the propeller and exhaust equipment will also be found in this box.

(2) The panel box contains all the panels with sockets and hinges all attached. The transverse and longitudinal wires will be found attached to the under side of the upper wing, coiled up and ready for attaching to the lower wing. The aileron control pulleys are all in place on the under side of the upper wing; the aileron

control cables are passed through these pulleys and coiled up—shackles and pin at one end for attaching to the control pylons of the aileron, and turnbuckles at the other end for attaching to the "lead" coming from the control bridge and through the side of fuselage. This case also contains the elevators and rudder, with control or operating pylons removed. All the control or operating pylons for the ailerons, elevators and rudder are packed in this case. Also, all the panel struts and engine section struts are packed in this box. The details of contents are given in the packing lists, marked "Panels."

2. HANDLING

In handling and hoisting these shipping boxes, care should be taken when using a sling that the center of the lift comes somewhat ahead of the center of the box. This point can be quickly determined by trial, by lifting the bridle until the box rides level.

3. OPENING BOXES

The case should be placed on the ground or floor, on a firm bearing over its entire length. *Care should be taken to have the part marked "Top" uppermost.* This will avoid the possibility of wrenching the motor from its bed; also the necessity of turning the fuselage over. The top may be readily recognized by the construction: not having any metal straps tying it down. The top should be carefully pried loose with a crow-bar or similar tool. Then carefully remove the side and ends of the box. The bottom side and temporary struts of the packing case are left in place under the fuselage until ready to assemble the running gear in place.

The propeller, wheels and other parts packed in this case should be removed from the members of the packing case to which they are secured.

4. LANDING GEAR ASSEMBLY TO FUSELAGE

The landing gear (Part No. 5114; also see drawing No. 12251) is assembled by mounting the wheels on to the axle, and bolting wheels in place with bolts No. 4173–18 and accompanying nuts and cotters. The fuselage should now be elevated to receive the landing gear. This may be accomplished in one of two ways—either by tackle; or by shims and blocking.

(*a*) If block and tackle are used to raise the fuselage, pass a line under the engine bed supports or sills (Part No. 2881; see Drawing No. 12083) just to the rear of the radiator. To this line attach hook of block. Do NOT ATTACH LIFTING DEVICE IN ANY OTHER MANNER, TO AVOID DAMAGING OR CRUSHING SOME PART. With the fuselage now resting on its attached tail skid, lift the front end until the lower longeron clips for attachment of landing gear struts clear the landing gear. These clips on the lower longeron for connecting the front struts of the landing gear are found at Station No. 3 (see Drawing No. 12083). The clips on the lower longeron for connecting the rear struts are found at Station No. 5 (see Drawing No. 12083). The short bolts, with lock-washers, nuts and cotters, are found in the clips attached to the bottom longerons at Station No. 3 and Station No. 5. The lock-washers are put under the head of the bolt, and when the clips on the longerons line up with the clips on the ends of the struts of the landing gear, these bolts are passed down through the holes thus aligned. This places the nuts on the down side of the connection, thus facilitating assembling and inspection of connections. The castellated nuts are then put on the bolts and drawn up tight, until the drilled hole in the bolt is visible through the castle of the nut. Then insert cotter pin and spread the two leaves backwards over the nut. This locks the nut in place. When the landing gear has been completely assembled to the fuselage, the tail of the machine should be elevated and supported by a horse and blocking under Station No. 10 (see Drawing No. 12083), until the upper longeron is level. This can be determined by placing a spirit level on the upper longeron, between Station No. 10 and No. 12, at the tail or on the two engine bed sills (see Fig. No. 4).

(*b*) The other method that may be employed for raising the

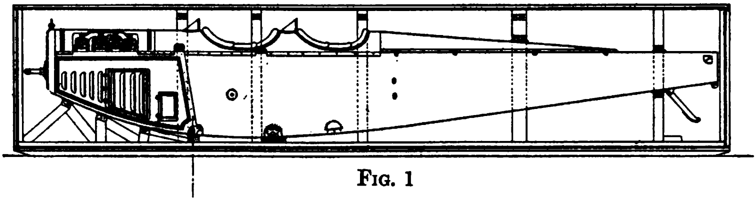


Fig. 1

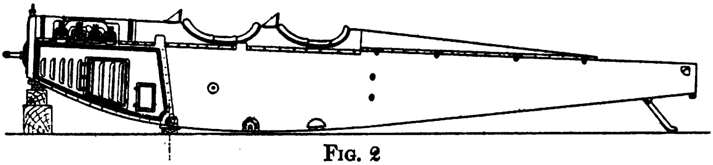


Fig. 2

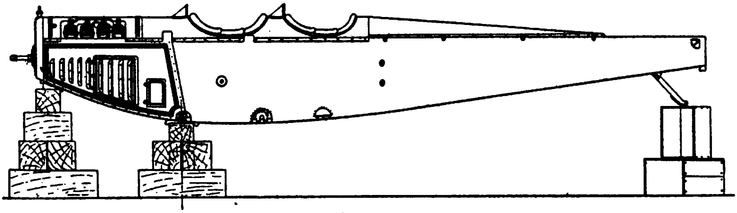


Fig. 3

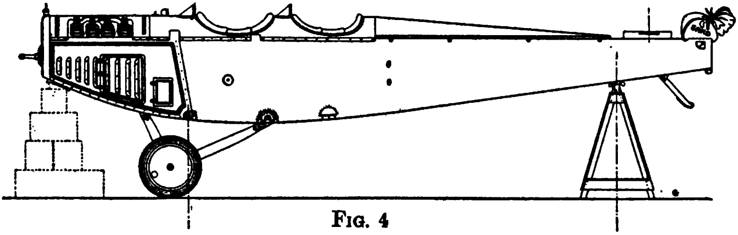
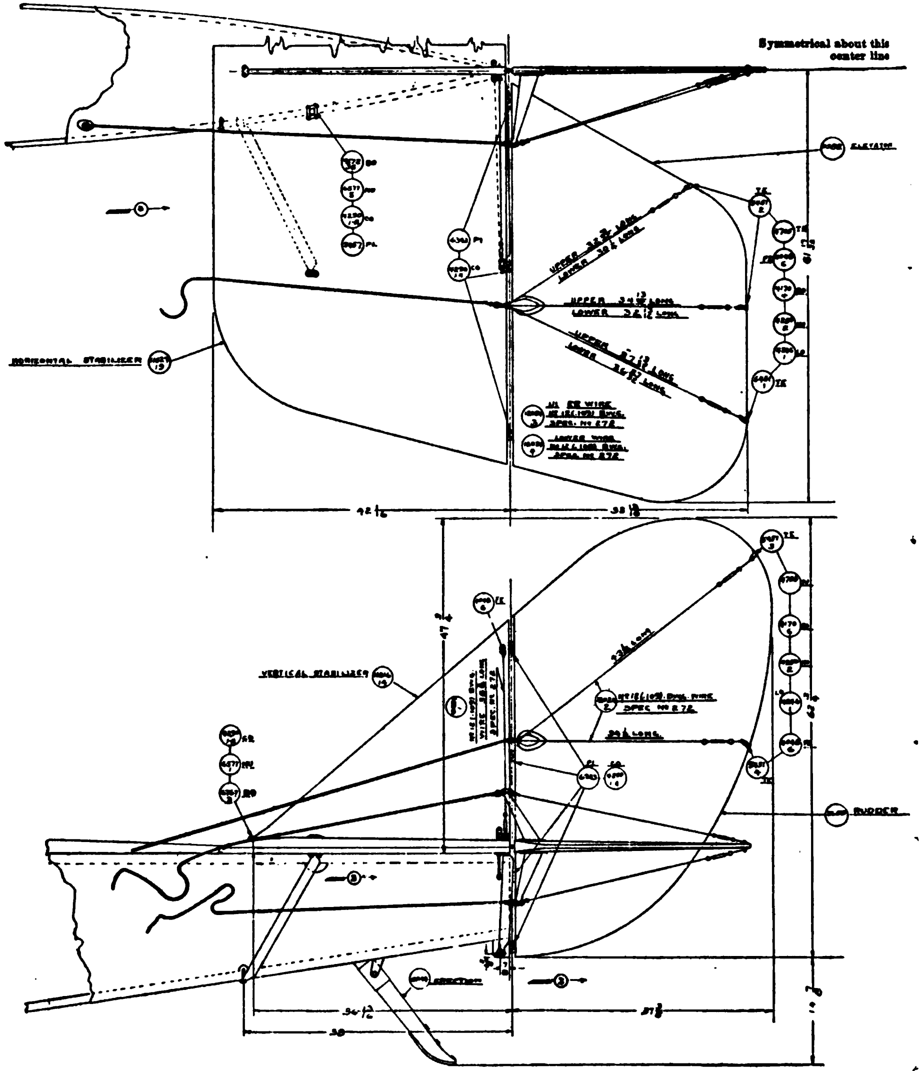


Fig. 4

front end of the fuselage, to assemble the landing gear, is the following: remove the shipping blocking and front flooring of shipping case from under the fore part of the fuselage. Insert a block under the bottom longerons at Station No. 4, thus coming ahead of the point on which the fuselage is resting, as shipped. This blocking should be aligned under the vertical strut (see Fig. No. 1). The flooring to the rear of the blocking should now be removed. By lowering the tail, the nose of the machine is elevated, the above mentioned blocking serving as a fulcrum. Block up under nose of machine, placing blocking under RADIATOR-BRACKET, AND NOT UNDER RADIATOR (see Fig. No. 2). If the tail of the machine be now lifted, this nose blocking serves as a fulcrum, and the fuselage at Station No. 4 will clear the blocking at that point. Block up again with wedges under Station No. 4 until blocking is tight against lower longeron (see Fig. No. 3). By depressing tail of machine, the nose will again be elevated so that the blocking there will now need to be increased. By this alternating method of changing the fulcrum point and increasing the blocking, the nose of the machine can ultimately be blocked up sufficiently high (with tail of machine on the ground and blocking at Station No. 4 removed) that the landing gear may be assembled to fuselage, Figure No. 4.

5. HORIZONTAL STABILIZER (Part No. 11627)

After the upper longeron is leveled up, the horizontal stabilizer (Part No. 11627) is assembled to the tail of the fuselage. From Drawings No. 12252 (Plan View) and No. 12024 (Fig. No. 5) the disposition of this member is shown. Each upper longeron has one U-bolt and four standard bolts, tied together in pairs on the under surface of the longeron by two connecting plates fastened to it. These bolts have the legs pointed upward, and serve to hold the horizontal stabilizer in place. These bolts are disposed as follows: One U-bolt is located just ahead of Station No. 9, and secures the leading edge of the horizontal stabilizer; the four bolts arranged in pairs are located approximately midway between Stations No.


Symmetrical about this center line
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HORIZONTAL STABILIZER
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VERTICAL STABILIZER
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Fig. 5

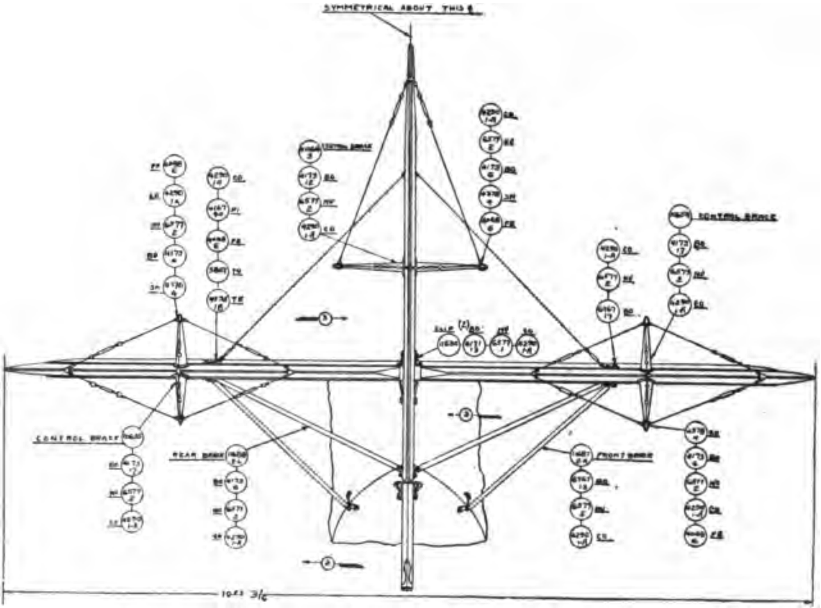

FIG. 5 TAIL (ERECTION)

10 and No. 11, and engage the front beam of the horizontal stabilizer. The horizontal stabilizer is aligned over these bolts, placing the washer plate (Part No. 5457) on the upper surface of the horizontal stabilizer, over the intermediate set of bolts between Station No. 10 and No. 11; and the two bolts on each side of the tail post at the upper longeron level. The nuts are all drawn up tight, until the hole drilled in the bolt becomes visible through the castle in the nut, and cotter pinned.

6. VERTICAL STABILIZER (Part No. 11616)

The vertical stabilizer is now fastened to the horizontal stabilizer:

(1) By means of the bolts which pass through the forward and after parts of the horizontal stabilizer, and

(2) By means of the flexible stay lines running from the top of the vertical stabilizer to the upper surface of the horizontal stabilizer (see Drawing No. 12024). The forward bolts pass through the clip at the lower front point of the vertical stabilizer. The bolts which are fastened to the tail post of the fuselage, and engage the after end of the horizontal stabilizer, also engage the lugs fastened to the bottom edge of the vertical stabilizer at the rear. Draw the nuts up tight and lock with cotter pins. The flexible wire cables, attached to the vertical stabilizer, and turnbuckles are used to align and tie down the vertical stabilizer.

7. RUDDER (Part No. 11659)

The control pylons or braces (Part No. 11066–3) are first attached to the rudder. These braces are so placed that the upper tips point toward the hinge line. In this fashion the holes will match up. The bolts and nuts for securing braces to the rudder are shipped and fastened to the braces. Before mounting the rudder the vertical stabilizer should be checked up, so that it is in plumb alignment with the tail post. This check is absolutely necessary to insure the absolute alignment of the hinges in the vertical stabilizer and the tail post. The rudder is now mounted onto the tail post and vertical stabilizer by means of the hinges. (See Drawings No. 12024 and

12251 for position and relations.) The hinge pins are now inserted in the hinges, and cotter pins passed through the drilled holes in the bottom of the pins. The cotter pins should be spread backward as usual.

8. ELEVATORS (Part No. 11582)

These are first equipped with the control braces (Part No. 10654), which, with the accompanying bolts, nuts and cotters, are found in the Wing Panel Packing Box. The position of the base of the control brace is indicated on Drawing No. 12024 (Fig. No. 5). These braces are also arranged so that the upper tips point toward the hinge line. The elevators are mounted to the horizontal stabilizer by means of the hinges and hinge pins. The hinge pins are kept in their bearings by the cotter pins, inserted through the drilled holes in the bottom of the hinge pins. The position of the elevators are shown on Drawing No. 12024, (Fig. No. 5).

9. PANEL ASSEMBLY

The panels are now to be assembled. Before the main panels can be connected to the fuselage, the engine section panel must be erected.

Engine Section Panel (Part No. 4773): The engine section struts are first set into place into their sockets on the upper longerons. These posts are found packed in the "Panel" box. The forward posts (Part No. 12520) are approximately held in place by the flexible wire lines to be found coiled up and temporarily fastened under the cowl in the motor compartment. The rear struts (Part No. 12521) are approximately held in place by the flexible wire lines leading from lower longeron, Station No. 7, and to be found coiled up under the aft-cowl. The engine section panel is now mounted on the struts, after the front transverse bracing, between the posts, is approximately trued up. The engine section panel posts and wires are then trued up prior to further erection. This condition is obtained by adjusting all "mated" or similar wires to the same length.

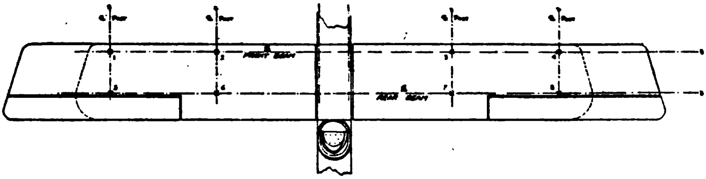

FIG. 6

10. MAIN PANELS

The main panels are now to be assembled to the machine. There are two methods for accomplishing this:

(*a*) Assemble panels, struts and wires, before attaching to fuselage.

(*b*) Assemble the upper plane to the engine section, and complete assembly.

The first method is the most advantageous, since it permits the setting of the main panels at the approximately correct stagger and dihedral, and does not require as much subsequent adjustment as the second method.

(A) FIRST METHOD—Wings Completely Assembled

All the main struts will be found to bear a number. These numbers run from 1 to 8. The method used in numbering the posts is as follows: Starting as post No. 1, with the outer post on the left hand side of the pilot, as he faces his direction of travel, the front posts are numbered successively from No. 1 to No. 4: Nos. 1 and 2 being on the left side and Nos. 3 and 4 being on the right side. The rear posts are similarly numbered from No. 5 to No. 8: Nos. 5 and 6 being on the left and Nos. 7 and 8 being on the right. This system of numbering does not include the engine section struts. Fig. No. 6, shows the system graphically.

The system of marking also insures that the struts are not inverted in their sockets. This is accomplished by painting the number on the strut, so that when viewed from the pilot's seat all numbers can be read; i. e., the numbers are painted on that side of the strut intended to face the fuselage, as diagrammatically shown in Fig. No. 6. If a strut be inverted by mistake, it can thus quickly be detected.

(1) The upper left wing panel (Drawing No. 4771) is first equipped with the front and rear masts by inserting the masts into their sockets on the upper surface of the panel. The mast wires are then connected up to the anchor plates, located on the upper surface to the right and left of the mast-socket. Adjust the tension

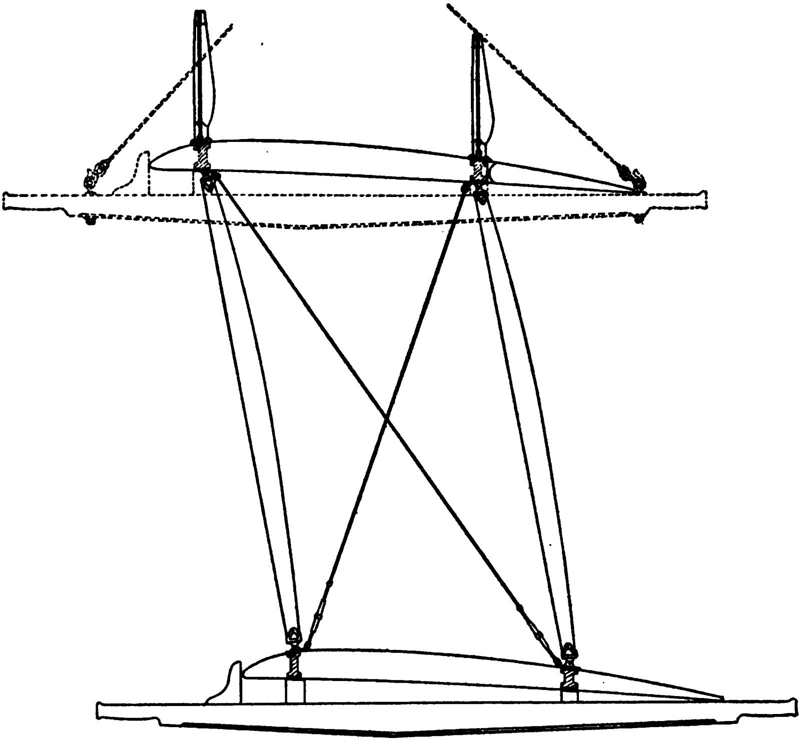

FIG. 7

in these wires, by means of turnbuckles, until the front and rear wing beams become straight.

(2) Stand the upper left wing panel and lower left wing panel on their "leading" or "entering" edges, properly supporting the panels in cushioned blocks to prevent damage to the nose. Space the panels apart, approximately equal to the length of the struts.

(3) Next connect up the diagonal cross wires. These must be loosely connected up (by loosening up the turnbuckles), to permit the easy entering of the posts into the sockets. The wires are connected before the posts or struts are set in place, since, with the latter in place, the connecting of the wires to the lugs of the sockets is accomplished only with difficulty. After these wires are thus connected, insert the posts and bolts into place.

(4) Connect up loosely the "landing" (single) wires and "flying" (double) wires of the outer bay to hold the wings together as a unit. The outer bay is thus completely wired, though but loosely.

(5) The posts that are used for this left side are, according to the diagram, No. 1, No. 2, No. 5 and No. 6. No. 1 is the outer front; No. 2 the inner front; No. 5 is the outer rear; No. 6 the inner rear.

(6) The wings, as above assembled, are now erected to the fuselage. Extreme care should be exercised in transferring the wings to the fuselage, not to strain or break them. In carrying the wings, use wooden boards placed under the wings, and block up under the wing beams (which can be easily located by the line of fittings attached) so that these take the strain of the load. Do not attempt handling assembled wings, using the posts as carriers, or by attachments to the trailing or leading edges. Fig. No. 7 shows a good manner in which the panels may be shifted.

The wings should be firmly supported temporarily by a suitable sling at the upper outer post point (not beyond this point), or by a horse, properly blocked under lower wing at outer lower post point (not beyond this point), during fitting of wing to machine. See Fig. No. 8 for arrangement. The wings will have the approxi-

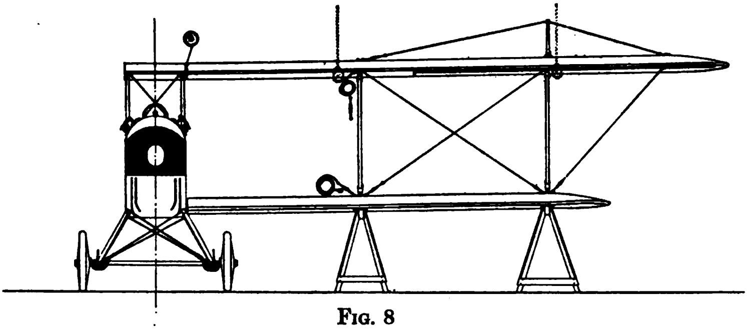

FIG. 8

mate stagger if assembled as above, since the posts are in place and the tension cross wires are adjusted to almost correct length when shipped. Insert the hinge pins through the hinges, located at ①, Fig. No. 8, as now coupled up.

ADJUSTMENT FOR DIHEDRAL

(7) The fuselage must now be levelled up transversely and longitudinally. A spirit level placed across the two engine bed supports will determine the transverse condition. With the level placed fore and aft on the longerons aft of Station No. 5, or on the engine beds, the longitudinal level is established.

(8) Adjust the tension on the flying and landing wires until the dihedral of one (1) degree is established, also to make the leading and trailing edges parallel and straight. The amount of lift for the one (1) degree dihedral is 2¾″ in 13′ 6″ (distance from the inner edge of the panel to the centerline outer post). An easy method for checking the correct adjustment of the dihedral is to place a block 2¾″ high on the upper surface of the lower wing, at the extreme inner edge. A straight edge resting on this block and on the upper surface of the wing (straight edge kept parallel to front or rear beam) should be level, Fig. No. 9.

This may also be checked by using a light spirit level, suspended from a string stretched over the given range. If a block 2¾″ high be clamped to the inner edge of the panel, and a line pulled taut from this block to the centerline of the outer beam, the level suspended next to the block will be sufficiently sensitive to determine the required degree of dihedral. Fig. No. 9 shows the arrangement diagrammatically.

If the outer end of the wings is too high, the landing (single) wires are too short and the flying (double) wires are too long. Hence, loosening up equally on the inner and outer, front and rear flying (double) wires, will correct this condition. If the panels are too low (dihedral not up to one degree), reversing the above method corrects this condition.

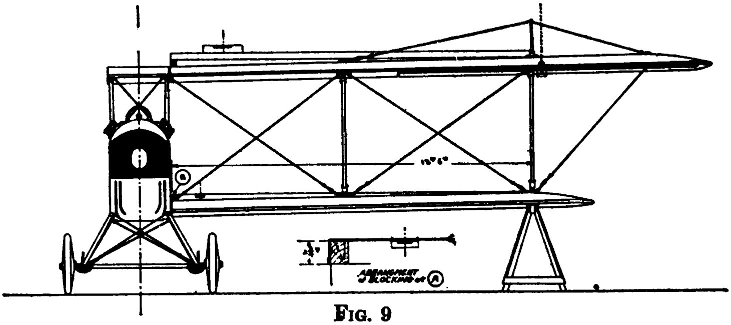

FIG. 9

ADJUSTMENT FOR STAGGER

(9) The tension in the longitudinal cross wires is now adjusted for stagger. The distance between a plumb line dropped from the leading edge of the upper wing and the leading edge of the lower wing should be $12\frac{5}{16}$ inches. If the amount is less than $12\frac{5}{16}$ inches, the line leading from the lower wing front socket to the upper wing rear socket is too long. Hence, drawing up on this line and lengthening out on the cross line will correct this condition. If the distance is more than $12\frac{5}{16}$ inches, reverse corrections of wire lengths (see Fig. No. 10).

(10) Check up the dihedral to see if this has been disturbed while setting stagger. Also check up with eye the alignment of the front and rear beam, and parallelism of leading and trailing edges. If these are not parallel, adjustment of the landing (single) wires in the inner bay (next to fuselage) will generally correct this condition.

(11) The wing skids on the under side of the lower wing should now be fastened to the sockets, directly under the outer posts.

(12) Bend all cotter pins out, and lock turnbuckles with safety wires. This latter is accomplished by first passing a soft wire through the eye of one shank of the turnbuckle, then winding the wire four to five times about the shank, the shorter, loose end of the wire being wrapped under the windings; then pass the free end through the small hole in the center of the barrel, then through the eye of the opposite shank, wrapping this free end around this shank and wire. This effectively locks the turnbuckles.

(13) The other side of the machine (right side) is then assembled in the same manner.

(B) SECOND METHOD OF ERECTING PANELS

The following outline method is given; the details of handling and adjusting of wires is identical with the details given for the first method:

(1) Insert masts (cabanes) into sockets and connect mast wires

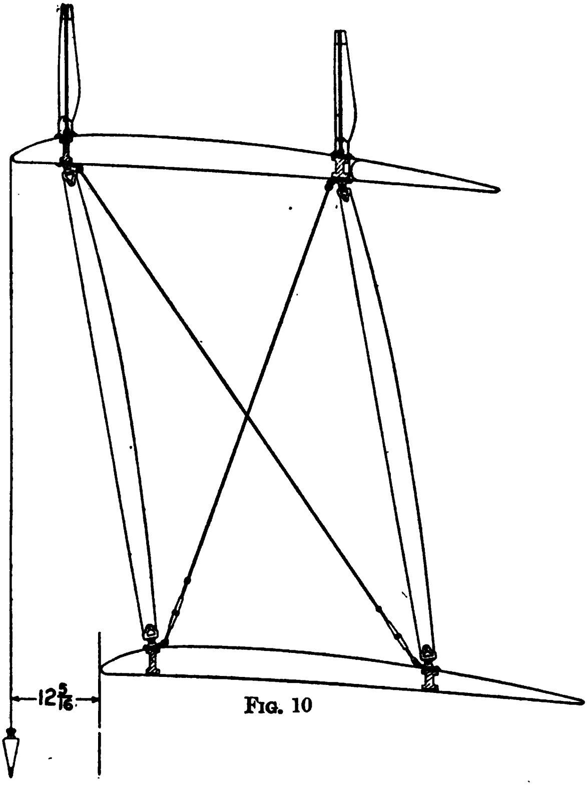

FIG. 10

to anchor terminals. Adjust tension of mast wires until beams are straight.

(2) Connect upper panel to engine section and bolt upper end of struts into fittings.

(3) Jack up wing tip of upper panel so that lower panel can be connected.

(4) Connect lower panel to fuselage.

(5) Connect cross diagonal wires.

(6) Bolt lower end of struts into fittings on lower wing.

(7) Connect landing (single) wires.

(8) Connect flying (double) wires.

(9) Proceed in like manner with other side of machine.

(10) Remove jacks and level fuselage longitudinally and transversely.

(11) Adjust tension on landing (single) and flying (double) wires until the dihedral is one degree; leading and trailing edges are parallel and straight.

(12) Adjust tension on diagonal wires until stagger is $12\frac{5}{16}$ inches.

(13) Attach wing skids.

(14) Bend cotter pins and safety wire turnbuckles.

12. AILERON ADJUSTMENT

Attach both ailerons (one on each side of machine, after having mounted control braces to ailerons) and fasten pins of hinges with the necessary cotter pins. Temporarily support ailerons so that their *trailing edges* are one (1) inch *below* the trailing edges of the upper panels. Then connect up the flexible tie-line that, passing over the top of the upper wings, through fairleads, is connected at the center by a turnbuckle, and, passing through pulleys attached to the upper surface, front beam, is attached (by shackle and pin) to the upper control brace of the aileron. This "lead" is allowed, so that when in flight, the force of the lift will somewhat raise *both* ailerons and bring their trailing edges on a line with the trailing edges of the panels. Now lead the end of the aileron control line attached to bridge through the hole in each side of the fuselage (between front and rear seats). Uncoil the connecting line which passes over the pulley attached to the lower surface of the upper wing, near the front outer post. Attach shackle and pin end to lower control brace of aileron, and attach turnbuckle end to loop of aileron control lead attached to bridge (and which passes through side of fuselage). In making this last attachment, the leads should be so arranged (by moving the wheel on the bridge) that the lengths projecting through the fuselage are equal.

13. RUDDER CONTROL ADJUSTMENT

Uncoil the lines attached to the rudder bar, to lead out through the upper surface of the rear end of the fuselage cover, and, keeping the rudder control bar at right angles to the longitudinal axis of the machine, fasten the ends to the control braces. Next take up the slack of the lines, by means of the turnbuckles, adjusting the tension equally in each set; the rudder control bar (foot control bar) should remain at right angles to the longitudinal axis, when the rudder is neutral (or in a vertical plane through this fore and aft axis).

14. ELEVATOR CONTROL ADJUSTMENT

Temporarily maintain the elevators in the plane of the horizontal stabilizer (neutral position). Move the U bridge forward until the distance between the instrument board and the nearer surface of the tube of the bridge is nine (9) inches. By fixing this distance from the instrument board or dash to the back of the bridge, a slight lead is given to the control, for the greater range for raising the elevators. Now uncoil the wires leading from the clips attached to the sides of the bridge, and coiled up aft the pilot's seat. Pass the wire attached to the lower clips out through the side of the fuselage, through the lower of the two vertical holes, aft of the pilot's seat. With the bridge lashed, or fastened to the nine (9) inch position, connect this wire to the upper control brace of the elevator. Repeat operation for other side of machine.

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Similarly the wire attached to upper clip on U bridge is passed through the upper hole in fuselage side, and attached to the lower control brace of the elevator. Fasten the flexible tubing fairleads (Part No. 5032-1) on the upper brace control wire to the leading edge of the horizontal stabilizer. Drawing No. 11965, Fig. No. 11, shows the general arrangement of the controls. Adjust tension in these wires, by means of turnbuckles, so that all lines have the same degree of tautness. The elevators will then be neutral for this position of the bridge.

15. GENERAL

All connections having now been made, carefully go over each shackle, pin and turnbuckle, and see that all pins are properly in place, all nuts on bolts tight, and all cotter-pinned. Try out all controls for action and freedom of movement. See that no brace wires are slack, yet not so taut that, when plucked, they "sing."

Attach nose wires leading from nose of machine to intermediate posts, front and rear. The lower wire connects up with the lower front socket, on the upper surface of the lower panel; the upper wire connects up with the upper rear socket plate on the under side of the upper panel, after the panels are attached to fuselage, with stagger and dihedral properly corrected.

HINTS ON FLYING

RIGHT HAND TRACTORS

(1) Look over machine in general way.

(2) Be sure of gasoline, oil and water.

(3) Test motor for revolutions.

(4) Be sure controls are working properly.

(5) Start off full power directly into wind.

(6) Watch your direction carefully and contract with right rudder the machine's tendency to turn to the left, due to the propeller's air blast striking the left side of fin more forcibly than the right side.

(7) After attaining a few feet headway, raise the tail with controls and keep it in this position to prevent machine from leaving the ground until it is well past its minimum flying speed, at the same time watching your direction carefully. If your course permits keep your machine on the ground until its maximum ground speed is reached. Then, very easily and smoothly, take it off the ground. By following the above plan of a high speed take-off a large degree of safety is assured for if engine trouble develops soon after, you have surpassed the machine's minimum flying speed and you have a good chance to pick a landing spot that would not be possible if the take-off were made at slow speed, for the machine would immediately start sinking on loss of power and also lose its controllability to a large degree.

(8) The most dangerous place for engine failure is just after leaving the ground.

(9) When once under way it is advisable to attain a safe altitude as soon as possible, and it will be found that the best results can be attained by a high speed, low-angle climb rather than a slow speed, large angle. A steady, fast climb is the best for all purposes.

(10) After a height of not less than 800 feet, a turn can be contemplated. It is advisable to reach a higher altitude if possible,

but do not attempt one lower unless necessity demands to miss obstructions or to play safe on a certain forced landing spot in case of engine trouble.

(11) Never forget that the engine may stop, and at all times keep this in mind and plan on a safe landing place within gliding distance of wherever you may be. If you are still on the climb and wish to make a rather short turn, nose the machine over until you are flying level so as to keep the speed high. At the same time bring to play the rudder and ailerons in the correct proportions and in the proper directions to give a smooth, even turn. A large, easy turn with little bank is more to be encouraged than short, sharp ones, using a steep bank, for if banking is not properly done either skidding or side-slipping develops, both of which, if carried too far, are very dangerous. At no time let your machine attain a high angle of climb, for in so doing you are encouraging it to stall which would necessitate considerable altitude to recover from safely. At all times remember that although you are controlling the actions of the machine it has a considerable amount of stability itself, and be a little free with the controls rather than stiff and rigid.

(12) Do not at any time jerk the controls, but be firm and steady and above all smooth in their operations. This forms a quiet and confident mind which is invaluable in flying, also it reduces the strains on the machine to the minimum. Now that a safe altitude has been reached your anxiety diminishes, for with height there is safety; but remember to keep within gliding distance of a landing place.

(13) Directions of wind here enters on the gliding possibilities of your machine, for although at all times you go the same rate of speed through the air your relations with the ground change with the wind, so if you have to glide into a wind you cannot glide as far over the ground from a given height as you can if the same wind were behind you. You will also notice by flying in a side wind that in order to keep a straight course over the ground the machine must be swung around into the wind on an angle depend-

ing on the velocity of the wind. This is to offset the drift of the machine.

(14) Drift must also be counted on in making turns, for by side drifting the horizon appears to be moving in the opposite direction, which is very apt to mislead one as to his actual turning from the result of the rudder.

LANDING

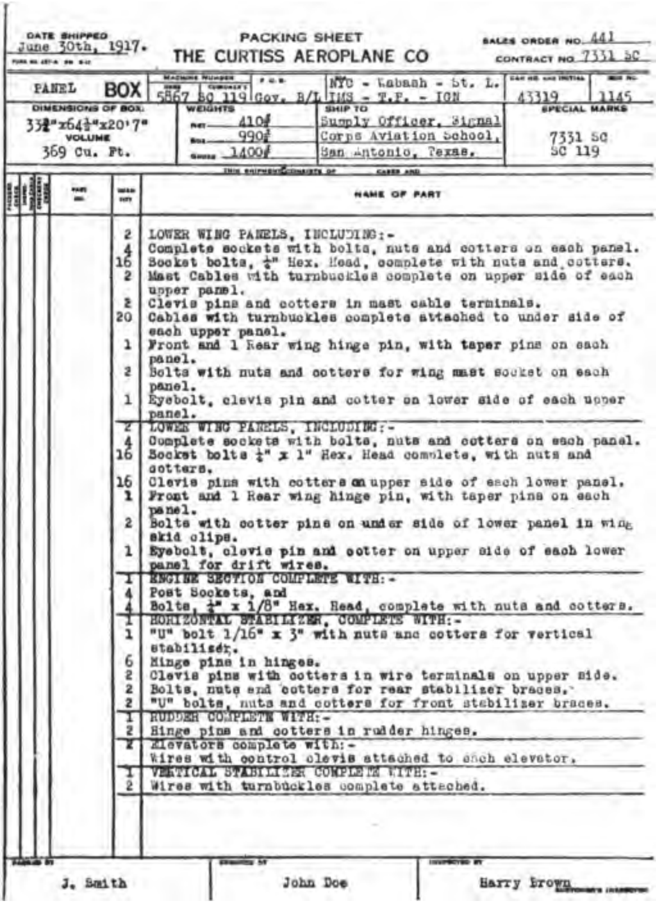
(15) When within the correct distance for a glide of medium velocity to your contemplated landing place, shut off the engine and nose machine over to the proper gliding angle and head for the field in a direction to bring you directly into the wind. If you find you are too close to the field and your machine is developing excessive speed, start "S-ing" to reduce your speed as well as altitude. If you have considerable altitude to spare an easy spiral may be executed, but neither of these should be tried unless you are perfectly confident of their success. The best way is a long, straight glide into the field, and it gives one a fine chance to judge distance and wind.

(16) Never glide too flat for your speed falls off and you settle instead of glide down. In so doing your controls become inactive to a large degree, and this must be avoided in all cases. A strong blast must be on all controls in the correct direction at all times to have the machine sensitive to their movements. When you have glided toward the field and are still about fifty feet from the ground you should start leveling off, but gradually allow the machine to glide down within about six feet of the ground where the final leveling off begins. At this point the machine is skimming along, neither rising nor falling, until its velocity wanes, then as it sinks you increase the wings' angle to the air so as to bring the lift again up to the weight of the machine for its loss in speed. As the speed lessens the angle should increase more rapidly until the machine is flying in the correct position for landing at its minimum flying speed. At this point the machine should be just grazing the ground with its wheels and tail skid. Only practice will perfect landings,

for it's only a combination of good judgment of distances and speeds.

(17) In making turns you will notice the marked tendency of the machine to nose down on a right-hand turn and to climb on a left one, the latter not being so noticeable as the former. These peculiar actions of the machine are caused by the gyroscopic force of the revolving propeller and must be compensated by the elevators to keep the machine level. In banks of over 20 degrees the rudder and elevators begin to exchange their proper actions with one another until the vertical is reached, when the change is complete. This must be clearly understood, for to expect the elevators to control the horizontal balance of the machine when on a steep bank and the rudder to control the direction of same might end disastrously.

(18) The most common danger at present to new students is the spinning nose dive or tail spin. Although it is not dangerous to the man who knows how to get out of one, it is very wise for the beginner to stay well away from the possibilities of having the chance to see if he can get out of one. There are several ways of getting started on a spin, but excessive banking with considerable rudder on seems to be the foremost way of all. In turning, if the nose falls due to stalling or some other cause, a spin may develop. In a spin the ailerons and elevators are useless, for the air blast strikes them from the side instead of straight on. The only available control is the rudder, and this is your best friend. All the possible rudder should be put on in the opposite direction than you are spinning even if you have to put both feet on one side of the rudder bar. Remember to hold that rudder and keep the motor going full to supply all the possible air blast. This is the only remedy and if you have enough altitude you have nothing to worry about. The centrifugal force of the revolving machine must first be stopped and this takes place somewhat slowly, but as soon as you feel the rudder acting you will feel your elevators and ailerons regaining their control, whereby you can complete the work started by the rudder and regain your proper balance.



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PACKING SHEET
THE CURTISS AEROPLANE CO

SALES ORDER NO. 441
CONTRACT NO. 7331 SC

PANEL BOX
MACHINE NUMBER 5867 SC 119
F.O.B. Gov. B/L
NYC - Wabash - St. L. IMS - T.P. - IGN
43319
1145

DIMENSIONS OF BOX
33½"x64½"x20'7"
VOLUME
369 Cu. Ft.

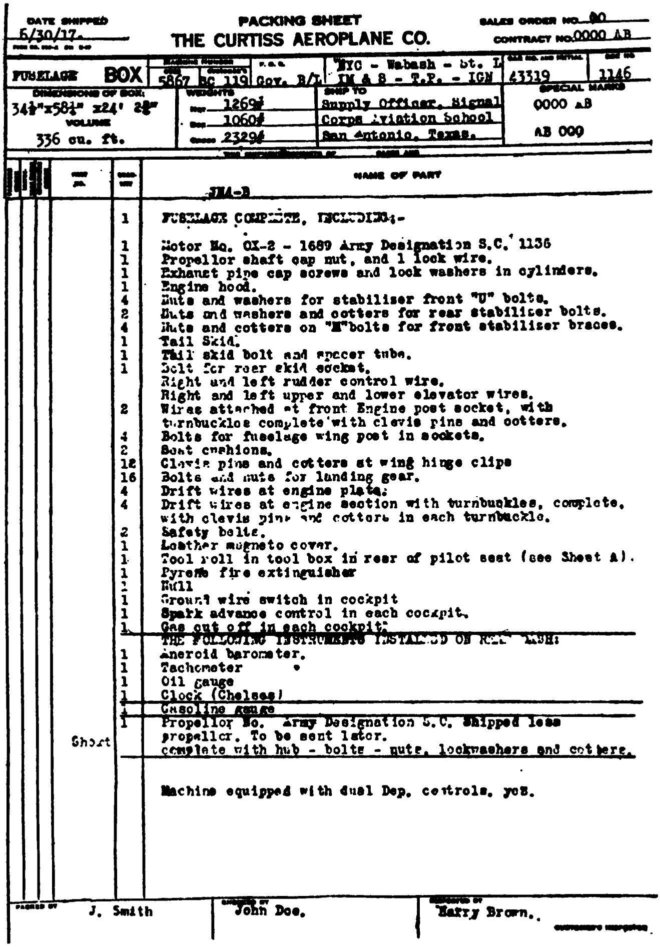
WEIGHTS
NET 410#
BOX 990#
GROSS 1400#

SHIP TO
Supply Officer, Signal
Corps Aviation School,
San Antonio, Texas.

SPECIAL MARKS
7331 SC
SC 119

	NAME OF PART
2	LOWER WING PANELS, INCLUDING:-
4	Complete sockets with bolts, nuts and cotters on each panel.
16	Socket bolts, ¼" Hex. Head, complete with nuts and cotters.
2	Mast Cables with turnbuckles complete on upper side of each upper panel.
2	Clevis pins and cotters in mast cable terminals.
20	Cables with turnbuckles complete attached to under side of each upper panel.
1	Front and 1 Rear wing hinge pin, with taper pins on each panel.
2	Bolts with nuts and cotters for wing mast socket on each panel.
1	Eyebolt, clevis pin and cotter on lower side of each upper panel.
2	LOWER WING PANELS, INCLUDING:-
4	Complete sockets with bolts, nuts and cotters on each panel.
16	Socket bolts ¼" x 1" Hex. Head complete, with nuts and cotters.
16	Clevis pins with cotters on upper side of each lower panel.
1	Front and 1 Rear wing hinge pin, with taper pins on each panel.
2	Bolts with cotter pins on under side of lower panel in wing skid clips.
1	Eyebolt, clevis pin and cotter on upper side of each lower panel for drift wires.
1	ENGINE SECTION COMPLETE WITH:-
4	Post Sockets, and
4	Bolts, ¼" x 1/8" Hex. Head, complete with nuts and cotters.
1	HORIZONTAL STABILIZER, COMPLETE WITH:-
1	"U" bolt 1/16" x 3" with nuts and cotters for vertical stabilizer.
6	Hinge pins in hinges.
2	Clevis pins with cotters in wire terminals on upper side.
2	Bolts, nuts and cotters for rear stabilizer braces.
2	"U" bolts, nuts and cotters for front stabilizer braces.
1	RUDDER COMPLETE WITH:-
2	Hinge pins and cotters in rudder hinges.
2	Elevators complete with:-
	Wires with control clevis attached to each elevator.
1	VERTICAL STABILIZER COMPLETE WITH:-
2	Wires with turnbuckles complete attached.

PACKED BY	CHECKED BY	INSPECTED BY
J. Smith	John Doe	Harry Brown



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PACKING SHEET

THE CURTISS AEROPLANE CO.

SALES ORDER NO. 00

CONTRACT NO. 0000 AB

FUSELAGE BOX

5867 | SC 119 | F.O.B. Gov. B/L | NYC - Wabash - St. L IM & S - T.P. - IGN | 43319 | 1146

DIMENSIONS OF BOX: 34½"x58¼" x24' 2⅝"

VOLUME 336 cu. ft.

WEIGHTS 1269# 1060# 2329#

SHIP TO Supply Officer, Signal Corps Aviation School San Antonio, Texas.

SPECIAL MARKS 0000 AB AB 009

		NAME OF PART
		JN4-B
	1	FUSELAGE COMPLETE, INCLUDING:-
	1	Motor No. OX-2 - 1689 Army Designation S.C. 1136
	1	Propellor shaft cap nut, and 1 lock wire.
	1	Exhaust pipe cap screws and lock washers in cylinders.
	1	Engine hood.
	4	Nuts and washers for stabiliser front "U" bolts.
	2	Nuts and washers and cotters for rear stabiliser bolts.
	4	Nuts and cotters on "M" bolts for front stabiliser braces.
	1	Tail Skid.
	1	Tail skid bolt and spacer tube.
	1	Bolt for rear skid socket.
		Right and left rudder control wire.
		Right and left upper and lower elevator wires.
	2	Wires attached at front Engine post socket, with turnbuckles complete with clevis pins and cotters.
	4	Bolts for fuselage wing post in sockets.
	2	Seat cushions.
	12	Clevis pins and cotters at wing hinge clips
	16	Bolts and nuts for landing gear.
	4	Drift wires at engine plate.
	4	Drift wires at engine section with turnbuckles, complete, with clevis pins and cotters in each turnbuckle.
	2	Safety belts.
	1	Leather magneto cover.
	1	Tool roll in tool box in rear of pilot seat (see Sheet A).
	1	Pyrene fire extinguisher
	1	Null
	1	Ground wire switch in cockpit
	1	Spark advance control in each cockpit.
	1	Gas cut off in each cockpit.
		THE FOLLOWING INSTRUMENTS INSTALLED ON REAR DASH:
	1	Aneroid barometer.
	1	Tachometer
	1	Oil gauge
	1	Clock (Chelsea)
	1	Gasoline gauge
Short	1	Propellor No. Army Designation S.C. Shipped less propeller. To be sent later. complete with hub - bolts - nuts, lockwashers and cotters.
		Machine equipped with dual Dep. controls, yes.

PACKED BY J. Smith | CHECKED BY John Doe. | INSPECTED BY Harry Brown.

MEMORANDA

THE MATTHEWS-NORTHRUP WORKS, BUFFALO, CLEVELAND AND NEW YORK

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